**A Comparative Analysis**

**of**

**Two Student Chairs**

**Proposed for**

**The University of Arizona**

**Lizard Gulch Campus**

by

Ed Lindquist, Chief Analyst

Posterior Consultants Limited

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for

Facilities Department

University of Arizona

Tucson, Alaska

by

Ed Lindquist, Chief Analyst

Posterior Consultants Limited

March 15, 2010



***“Chair-ity Begins at Home – and Stops at the Seat”***

***4600 Flambeau Parkway***

***Peters Creek, Alaska 95000***

***Phone: (907) 868-2858***

February 15, 2017

Dr. Zephart D. Seuss

Facilities Director

University of Arizona

111 HoHum Circle

Tucson, Alaska 95000

Dear Dr. Seuss:

Attached is our report on the comparison of two student chairs under consideration for purchase for the Lizard Gulch Campus. We appreciate that you chose Posterior Consultants, Ltd. to provide this report. I believe that you will find the report thorough and full of hard data which will be important for the bottom line and we believe that it will sit well with you.

We have enjoyed the opportunity to complete this report and stand firmly and solidly on our recommendation that the *Rock Bottom*™ student chair is the best product you can use for the intended purposes. We have applied every test possible in the unique University environment which exists at the Lizard Gulch campus and have sought to examine every facet, angle, and aspect in these processes.

We are happy to provide this report and hope that you will send the check right away. Please call upon us for any consulting work that you might need in the future. We are also licensed for consulting on featherbeds and featherheads; this helps us to maintain a balance between light and heavy work.



Sincerely,

Ed Lindquist

Chief Analyst

ii

**TABLE OF CONTENTS**

 **Page**

LETTER OF TRANSMITTAL ii

ABSTRACT iv

INTRODUCTION 1

 Background 1

 Purpose of Report 2

 Qualifications of Consultant 2

 Data Sources 4

 Scope and Limitations 5

COLLECTED DATA 5

 Analysis of *Rock Bottom*™ Student Chairs 6

 Laboratory Analysis 6

 Client/User Surveys 6

 Review of Specialized Literature 7

 On-Site Testing 8

 Summary of Findings 9

 Interpretation of Findings 9

 Analysis of *ChairIsMatick*™ Student Chairs 9

 Laboratory Analysis 9

 Client/User Surveys 10

 Review of Literature 11

 On-Site Testing 11

 Summary of Findings 12

 Interpretation of Findings 13

CONCLUSION AND RECOMMENDATIONS 14

 Summary of Findings 14

 Conclusions 15

 Recommendation 15

APPENDIXES 16

 Appendix A. Laboratory Testing 16

 Appendix B. Sample Questionnaire 20

 Appendix C. Internet Sources 25

 Appendix D. Comparative Statistics 26

**ABSTRACT**

This report was prepared at the request of the University of Arizona’s Facilities Department because they have been seeking an objective analysis of student chairs to replace the existing student chairs at the Lizard Gulch Campus. Desert and equatorial conditions create a number of problems for the maintenance of chairs in a university environment. An analysis was made of two student chairs -- *Rock Bottom*™ and *ChairIsMatick*™ -- to recommend which student chair should be selected by the University.

The analysis was conducted by laboratory testing, by a review of the literature, and by a customer satisfaction survey. The following findings resulted from our analysis:

Findings Concerning *Rock Bottom* ™

•*Rock Bottom* ™are highly durable, long lasting chairs with a minimal comfort index, providing the advantage of keeping students awake if not alert. The claims of the manufacturers appear to be justified.

•Survey results are mixed, but tend to be more positive than negative, based upon the new requirements of a 45% approval rating to be a majority vote.

•The literature reveals a variety of different ways in which the student chair can be utilized in relationship to the environment and student demographic mix.

•The chairs themselves are relatively high cost, but they have a half life longer than plutonium and would most likely remain in the university classrooms in excess of two hundred years, thereby amortizing the high initial cost.

Findings Concerning *ChairIsMatick* ™

•*ChairIsMatick* ™ are fairly durable, well constructed chairs with a high comfort index, which may cause students not to focus on the presentation of highly amusing economics data. The life expectancy of the chairs is probably less than ten years, indicating a projected needed to replace them at that time.

•Survey results are mixed, but tend to be more positive than negative; however, there is concern about the lack of response to the survey, which often suggests lack of enthusiasm for a product.

•The literature reveals a variety of different ways in which the student chair can be utilized in relationship to the environment and student demographic mix.

•The chairs themselves are relatively low cost, but they will probably wear out in a ten year period, depending upon the number of student athletes who utilize them.

The conclusions and recommendations follow:

Conclusions

•Both *Rock Bottom* ™ and *ChairIsMatick*™ student chairshave been utilized by other institutions, including universities.

Using conservative financial forecasts, *Rock Bottom* ™ is the better choice when it comes to the bottom line.

iv

•Financial forecasts which can be assured to be positive might make *ChairIsMatick*™ a better choice, particularly because of rapid changes in seating technology. However, using •Although the initial capital expense for purchase is somewhat higher, the long range value of the chairs will make the investment very worthwhile in the long run. Although students preferred *ChairIsMatick*™, clearly they do not have the educational pedagogy necessary to comprehend all the implications of furniture as it relates to learning.

•It is clear that *Rock Bottom* ™ will keep students more on the edge of their seats, sitting upright, and forced to pay attention.

•Consequently, both in terms of investment and educational benefit, *Rock Bottom* ™ student chairs are the better choice.

Recommendation

•The University of Arizona should select *Rock Bottom* ™ student chairs to furnish the classrooms at the Lizard Gulch Campus.

v

**INTRODUCTION**

**Background**

The problems associated with providing student seating in the severe desert conditions which exist at the Lizard Gulch Campus of the University of Alaska has caused the Facilities Department of the University to budget funds for the replacement of student chairs in that facility. Preliminary research has indicated that there are two primary chair models which would best meet the challenges which Alaska student posteriors present. The University of Arizona Facilities Department has contracted with our firm to provide a detailed analysis of each of these chairs and to recommend which should be selected for installation. Since this is a major budget item and a precedent setting, not to mention sitting, decision, an unbiased, thoroughly researched analysis and investigation is extremely important. Consequently, the sophistication and complexity of the analysis is critical to ensure that good decisions are made based upon exemplary research.

Each of these chairs has been used by other institutions in Arizona, but these chairs have not been used at the University of Arizona previously.

The two student chairs which are being reviewed and analyzed in this study are:

 • *Rock Bottom* ™, manufactured by the *Sit Still Company*

 *Figure 1:* Sample *Rock Bottom* ™ Student Chairs

   

 • *ChairIsMatick*™, manufactured by *Sittinger, Plopdown, and Derriere, Inc.*

 *Figure 2:* Sample *ChairIsMatick*™ Student Chairs

   

1

**Purpose of Report**

The purpose of this report is to study, analyze, and research the qualities and characteristics of two student chairs -- *Rock Bottom*™ and *ChairIsMatick*™ -- to determine which student chair should be selected by the University of Arizona to replace the current student chairs at the Lizard Gulch Campus. Additional determinations may be made for long range planning for other University facilities. The report is prepared for the Facilities Department of the University for use in both their immediate and long-range facility planning efforts.

**Qualifications of Consultant**

*Posterior Consultants Limited* started in business just last week, but its consultants weren’t born yesterday. During the past three months, the company has written reports for over 5,000 large institutions, which they were able to achieve after having completed Technical Writing 212 at the University of Alaska. Our company had been operating informally after previous writing experience on bank checks that had been acquired through unusual procurement processes, but is now fully back in business as a result of new break-out technology. The University should have complete confidence in our abilities to provide the requested analysis, since most staff members have been confidence men for years.

The executive management of our consulting firm includes the following:

*Rock E. Rambeau,* Chief Executive Officer

 •Experience includes brains, brawns, and prawns

 •Utilizes high technology hard buns testing procedures

 •Graduated from Boxer University with a degree in arena management

 •Works with stares, chairs, and bears

*H. P. Drifter,* Chief Operations Officer

 •Experience includes furniture of all types, except cushioned

 •Graduated from University of Hard Knox, majoring in gold management

 •Speaks English and Italian equally well

 •Has a positive, upbeat attitude; someone always makes his day

2

*Merlin Billy Bobster,* Chief of Creative Analysis

 •Experience with concrete and abstract reality; real and imaginary chairs

 •Works on out of office assignments, often wand-ering around

 •Also works as spokesperson for the Gillette Corporation

 •Tends to sit at the head of the table in meetings

*O. L. Blue-Eyes,* Chairman of the Board

 •Known for his varied background; not sitting on his laurels

 •Former Chief Executive of Oceans 11 and the Rat Pack

 •Tends to write analytical reports his way

 •No university training, but often gives the third degree

Many of the rest of our on-the-ball staff are pictured below (some are experienced in bench warming and chair throwing):

  

A complete listing of all the employees who work for the Posterior Consulting firm can be obtained from our website: [www.posterior.org](http://www.posterior.org). Additionally, our firm keeps other consultants on retainer for special cases. For example, an entire English 212 class at the University of Alaska was recruited to test the chairs in the second floor classrooms of the Lizard Gulch Campus. The research obtained from that *ad hoc* group made it possible to recommend the replacement of the chairs. A side finding of that study indicated that the chairs appeared to be harder when the instructor was in the classroom than when he was not there.

3

**Data Sources**

In order to provide a proper analysis, it was critical to research all of the information related to the products in question before beginning with our standard investigative processes.

The literature and other research related to shredding have been thoroughly investigated. Our company prides itself on being up to date in chair making technology. The staff attends annual conferences and seminars on the latest methods for constructing, testing, and demolition of chairs. Our sources of information were several and varied. They include:

 •*The Weekly Seating Reader*: A weekly newsletter which discusses seating and chairs in a variety of settings (or sittings): federal prisons, executive conference rooms, university classrooms, and church pews.

 •*Chairs, Bears, and Fairs*: A national conference attended annually by all reputable companies in the chair related and wildlife management industries. •*Sunny and Chair.org*: An Internet Home Page and chat room describing the latest innovations in disposition improvement through high tech chair technology.

 •*Chair-itable Organizations*: Governmental publications which deal with both private and public sector use of chairs and the rules and regulations involved.

A thorough review of the literature made it possible for our organization to begin the analysis without repeating research which had already been conducted. Additionally, it allowed us to establish a framework to provide the parameters for our research while focusing on the most significant aspects of issues related to chairs and higher education.

4

**Scope and Limitations**

The following report will provide results relating to testing in the Lizard Gulch area only. Further, since this report is being provided for a university, the analysis will focus on the use of the two student chairs in a university setting.

The report is written exclusively for the University of Arizona and is not intended to offer conclusions for any other institution, city, state, or country. The report is copyrighted and may not be copied, reproduced, and translated into an MP3 file without the written consent of the Chief Executive Officer of Posterior Consultants, Ltd.

Since the report is being produced for a university, it may become available under the Freedom of Information Act. The university has made assurances that “sit-ins” will not be necessary to obtain information about sitting in.

This report and analysis should be replicated every two years since chair making technology is moving forward at a rapid rate; it is important that research does not lag behind, even though chairs often have some relationship to the behind.

**COLLECTED DATA**

An analysis was made of the qualities and characteristics of *Rock Bottom* ™ student chairs using the standard analytical techniques which are unique to Posterior Consultants Ltd. *ChairIsMatick*™ student chairs were then analyzed in a parallel manner. Findings, interpretation of findings, and conclusions were developed for each product. An overall recommendation will then be made concerning which product should be selected by the University for installation at the Lizard Gulch Campus.

Each product, *Rock Bottom* ™and *ChairIsMatick*™, was analyzed separately using the following techniques:

•Laboratory Analysis

•Client/User Surveys

•Research of Specialized Literature

•On-Site Testing

Findings and interpretation of findings are provided for each of the following criteria:

 •Comfort

 •Durability

 •Ability to adapt to changing temperatures within classrooms

 •Relationship to learning

 •Satisfaction surveys

 •Product cost

5

**Analysis of *Rock Bottom* ™**

**•Laboratory Analysis:**

*Rock Bottom* ™ student chairs were tested chemically to see if they could withstand the pressure generated by student posteriors in thousands of hours of classroom use. They were tested at a high heat (70° F) and a slightly higher heat (7000° F). At 70° F, *Rock Bottom* ™ student chairs retained their shape, texture, and high density; however, they tanned slightly. We were able to prevent this from occurring by applying several gallons of *Coppertone* (protection factor 1,987). At 7000° F, *Rock Bottom* ™ student chairs expanded significantly knocking down laboratory walls and blowing out windows.

  

*Rock Bottom* ™ student chairs were also tested under cold weather conditions (-60° F) and slightly colder conditions (-2000° F). These conditions were achieved by placing the product in an environment where three hundred former technical writing students gave the product a cold stare. *Rock Bottom* ™ student chairs did not crack, fold, spindle, or mutilate at any condition up to -1000° F. At temperatures lower than -1000° F, the product did swell around the edges and created a cold shoulder.

  

The specific details of these experiments are contained in Appendix A of this report.

**•Client/User Surveys:**

Customer satisfaction surveys were sent to those organizations that had previously used *Rock Bottom* ™ student chairs. The survey document contained 1,000 detailed questions requiring essay responses to each question. A copy of the survey form is found in Appendix B. The response rate was 45.2%, indicating that under new survey rules, a run-off survey was not required.

   

6

 The summary findings in the rated areas are shown on the following graph:



**•Review of Specialized Literature:**

A research of the available articles about *Rock Bottom* ™ provided the following articles:

* *"Rock Bottom* ™*’s for You and Me,”*  from The Seven Habits of Highly Effective

 Sitters, by Steven Lovey.

 The article expresses the notion that the "only good sit-uation is a

 *Rock Bottom* ™ chair."

 *Mr. Lovey*

* *"More Rock Bottom* ™ *Power for Students,”* from The Toolman News, by Tim Taylor.

 The article suggests that *Rock Bottom* ™ chairs will be more effective for university students if attached to the 7,000 horsepower Binford vibrating swivel.

 *Mr. Taylor*

* *"Rock Bottom* ™ *Chairs – Sharing the Feeling,”* from Men Are From Mars, Women Are For Chocolate, by Jeeper P. Creeper (no picture available).

 The article notes that men and women have different reactions to classroom sit- uations and that *Rock Bottom* ™ student chairs are extremely gender neutral.

Further sources of information can be found in Appendix C.

7

**•On-Site Testing:**

On-site testing was, as one might expect, carried out on site – in this case, the second floor of the main building of the Lizard Gulch Campus. Forty chairs were transported to the second floor utilizing the *Rocketman Specialized Moving Company*. Forty trips were required to take the chairs to the second floor from the semi-trailer in which they had been transported from the branch Peters Creek factory. The chairs were then placed in a hermetically sealed classroom on the north end of the building.

   

Once the chairs were in place, specialists from a subsidiary company of Posterior Consultants Ltd. were brought in. The name of the company is *Buns R Us*, whose employees are multitalented; in the morning, they work in a bakery; in the afternoons, they test chairs, couches, cots, and beds. The testers sat in the chairs for 36 hours on end (literally); during the tests, electrodes were attached to their bodies in several places to measure brain activity, heart rate, and gastrointestinal activity. The results were measured to develop an index of responsiveness from euphoria to malaise. The following graph indicates these factors as converted to a merged complex scale capable of measuring all factors:

**Index**

**of**

**Responsiveness**

  

**Some of the Testers**



8

**•Findings Concerning *Rock Bottom* ™**

* *Rock Bottom* ™are highly durable, long lasting chairs with a minimal comfort index, providing the advantage of keeping students awake if not alert. The claims of the manufacturers appear to be justified.
* Survey results are mixed, but tend to be more positive than negative, based upon the new requirements of a 45% approval rating to be a majority vote.
* The literature reveals a variety of different ways in which the student chair can be utilized in relationship to the environment and student demographic mix.
* The chairs themselves are relatively high cost, but they have a half-life longer than plutonium and would most likely remain in the university classrooms in excess of two hundred years, thereby amortizing the high initial cost.

**•Interpretation of Findings Concerning** ***Rock Bottom* ™**

The University Facilities Department should be aware of initial high cost, which can be amortized over time. These chairs will virtually last forever. A lease purchase option might be a good route if the decision is made to select the *Rock Bottom* ™student chairs. These chairs will keep students awake and provide the support they need, but they might make an unbearable class even more unbearable. The surveys indicated that university administrations favored the chairs more than the students.

**Analysis of *ChairIsMatick* ™**

**•Laboratory Analysis:**

*ChairIsMatick* ™ student chairs were tested chemically to see if they could withstand the pressure generated by student posteriors in thousands of hours of classroom use. They were tested at a high heat (70° F) and a slightly higher heat (7000° F). At 70° F, *ChairIsMatick* ™ student chairs retained their shape, texture, and high density; however, they started to soften around the edges. At 7000° F, *ChairIsMatick* ™ student chairs vaporized, leaving only a small residue of *Woolite* on the laboratory floor.

   

*ChairIsMatick* ™ student chairs were also tested under cold weather conditions (-60° F) and slightly colder conditions (-2000° F). These conditions were achieved by placing the product in an environment where three hundred former technical writing students gave the product a cold stare. *ChairIsMatick* ™ student chairs did not crack, fold, spindle, or mutilate at any condition up to -1000° F. At temperatures lower than -1000° F, the product crystallized into smaller particles; when reconstituted, there were more chairs than

9

previously, but they were only kindergarten size. Additionally, it was determined that most of the chairs had been produced using experimental techniques in movie theatres showing horror films, and that they could effectively be described as “I Scream Clones.”

  

The specific details of these experiments are contained in Appendix B of this report.

**•Client/User Surveys:**

Customer satisfaction surveys were sent to those organizations that had previously used *ChairIsMatick* ™ student chairs. The survey document contained 1,000 detailed questions requiring essay responses to each question. A copy of the survey form is found in Appendix B. The response rate was 25%, suggesting that interest in the chairs may not have been high. We have also found some indications that, in certain situations, people will not respond to surveys based on the advice of legal counsel – particularly if they have concern about their potential responses.

   

 The summary findings in the rated areas are shown on the following graph:



10

**•Review of Specialized Literature:**

A research of the available articles about *ChairIsMatick* ™ provided the following articles:

* *" ChairIsMatick* ™*’s for You and Me,”*  from The Seven Habits of Highly Effective

 Sitters, by Steven Lovey.

 The article expresses the notion that the "only good sit-uation is a

 *ChairIsMatick* ™ chair." (Mr. Lovey apparently doesn’t want to offend anyone.)

 *Mr. Lovey*

* *"More ChairIsMatick* ™ *Power for Students,”* from The Toolman News, by Tim Taylor.

 The article suggests that *ChairIsMatick* ™ chairs will be more effective for university students if they attach themselves to the 7,000 horsepower Binford vibrating swivel to stimulate their circulation because the chairs are sleep inducing.

 *Mr. Taylor*

* *" ChairIsMatick* ™ *Chairs – Sharing the Feeling,”* from Men Are From Mars, Women Are For Chocolate, by Jeeper P. Creeper (no picture available).

 The article notes that women prefer the *ChairIsMatick* ™ chair more than men because it appeals to their feminine psyches where as most university men do not consider the chair macho enough.

Further sources of information can be found in Appendix C.

**•On-Site Testing:**

On-site testing was, as one might expect, carried out on site – in this case, the second floor of the main building of the Lizard Gulch Campus. Forty chairs were transported to the second floor utilizing the *Rocketman Specialized Moving Company*. Forty trips were required to take the chairs to the second floor from the semi-trailer in which they had been transported from the branch Cactus Canyon factory. The chairs were then placed in a hermetically sealed classroom on the north end of the building.

   

11

Once the chairs were in place, specialists from a subsidiary company of Posterior Consultants Ltd. were brought in. The name of the company is *Buns R Us*, whose employees are multitalented; in the morning, they work in a bakery; in the afternoons, they test chairs, couches, cots, and beds. The testers sat in the chairs for 36 hours on end (literally); during the tests, electrodes were attached to their bodies in several places to measure brain activity, heart rate, and gastrointestinal activity. The results were measured to develop an index of responsiveness from euphoria to malaise. The following graph indicates these factors as converted to a merged complex scale capable of measuring all factors:

**Index**

**of**

**Responsiveness**

  

**Some of the Testers**



**•Findings Concerning *ChairIsMatick* ™**

* *ChairIsMatick* ™ are fairly durable, well constructed chairs with a high comfort index, which may cause students not to focus on the presentation of highly amusing economics data. The life expectancy of the chairs is probably less than ten years, indicating a projected needed to replace them at that time.
* Survey results are mixed, but tend to be more positive than negative, however, there is concern about the lack of response to the survey, which often suggests lack of enthusiasm for a product.
* The literature reveals a variety of different ways in which the student chair can be utilized in relationship to the environment and student demographic mix.
* The chairs themselves are relatively low cost, but they will probably wear out in a ten-year period, depending upon the number of student athletes who utilize them.

12

**•Interpretation of Findings Concerning** ***ChairIsMatick* ™**

The University Facilities Department should be aware that the initial lower cost may be offset by the fact that these chairs have about a ten-year life span. However, they will provide a comfort and ambience level in the classroom which some students would describe as “stylin.” Additionally, the chairs appear to produce almost too much comfort for them to remain in a non-somnolent state, particularly for the long evening classes that the Lizard Gulch Campus is famous for. The surveys indicated that students favored the chairs more than the university administrators.



13

**CONCLUSIONS AND RECOMMENDATIONS**

**•Summary of Findings**

The findings are summarized by the charts below:





Further statistics are found in Appendix D.

14

**•Conclusions**

Both *Rock Bottom* ™ and *ChairIsMatick*™ student chairshave been utilized by other institutions, including universities. Financial forecasts which can be assured to be positive might make *ChairIsMatick*™ a better choice, particularly because of rapid changes in seating technology. However, using conservative financial forecasts, *Rock Bottom* ™ is the better choice when it comes to the bottom line. Although the initial capital expense for purchase is somewhat higher, the long range value of the chairs will make the investment very worthwhile in the long run. Although students preferred *ChairIsMatick*™, clearly they do not have the educational pedagogy necessary to comprehend all the implications of furniture as it relates to learning. It is clear that *Rock Bottom* ™ will keep students more on the edge of their seats, sitting upright, and forced to pay attention. Consequently, both in terms of investment and educational benefit, *Rock Bottom* ™ student chairs are the better choice.

**•Recommendation**

The University of Arizona should select *Rock Bottom* ™ student chairs to furnish the classrooms at the Lizard Gulch Campus.

Although it was not requested in this study, it is also recommended that *Rock Bottom* ™ student chairs be selected whenever student seating is needed.

15

**Appendix A:** Laboratory Testing Procedures

 *Note:* Due to confidentiality provisions, these laboratory procedures are written in

 coded text. Those persons who are authorized to read this material should already

 have the proper codes; otherwise, contact Better Shredders, Inc. – Chief of

 Operational Security.

### Methods

#### Antigen Preparation

Recombinant anthrax toxin protective antigen (rPA) with an amino acid sequence concurring with that from the *Bacillus anthracis* V770-NP1-R anthrax vaccine strain was obtained fromthe National Institute of Craniofacial and Dental Research, National Institutes of Health, Bethesda, MD. Antigen was stored frozen at –80°C in small aliquots (10–100 µL, 4.75 mg/mL) in 5 mM Hepes, pH 7.3. Antigen was expressed from the attenuated asporogenous host *B. anthracis* BH445 and purified to homogeneity as described ([4](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380.htm#1#1)).

#### Furniture Analysis for Determination of Diagnostic Specificity and Sensitivity

To determine the background level of anti-PA ELISA reactivity in a cross-section of the U.S. population, a panel of 238 control sera from healthy adult persons was assembled from the CDC Occupation Health Service and the National Health and Nutrition Examination Survey (NHANES, CDC) serum collections. Donors were selected on the basis of having no known exposure to *B. anthracis* or anthrax and no known history of anthrax vaccination. In addition, a panel of 277 sera was assembled from persons with clinically confirmed non-anthrax-related illnesses (acute hepatitis A, acute hepatitis B, influenza A and B, brucellosis, staphylococcal toxic-shock syndrome, group A streptococcal infections, legionellosis, *Chlamydia pneumoniae* infection, and *Mycoplasma pneumoniae* infection) and from children and adults who had received non-anthrax-related vaccines (trivalent influenza, hepatitis B, tetanus toxoid, and botulinum toxoid). To determine assay sensitivity, an additional panel of 68 sera from persons who had received anthrax vaccine adsorbed (AVA) and 19 control sera from nonvaccinees was obtained. All sera were tested in duplicate without heat inactivation.

#### Construction Analysis Preparation

The anti-AVA standard human reference serum, AVR414, was prepared by plasmapheresis of healthy adult CDC volunteers who had received at least four subcutaneous injections of Anthrax Vaccine Adsorbed (AVA, BioPort Corp., Lansing, MI) with the licensed regimen (0, 2, and 4 weeks; 6, 12, and 18 months; and yearly boosters). Plasmapheresis and serum conversion were done at the Emory Transfusion Medicine Program, Emory University School of Medicine (Atlanta, GA) and the Scientific Resource Program at CDC, respectively. Plasmapheresis was done by the TPE DUAL- NEEDLE procedure with the COBE SpectraApheresis System(Gambro BCT, Inc., Blood Component Technology, Lakewood, CO) and following the manufacturer’s procedure manual (Manual #701900–000 1999/1). Each plasma unit was clotted with sterile glass microbeads (B. Braun Instruments, Burlingame, CA) and suspended in 1.5 M CaCl2–2.0 M ,-amino-caproic acid. All units were allowed to clot overnight at room temperature and were then centrifuged at 2,200 x *g* at 4°C for 15 min. The serum from each unit was stored in a 500-mL sterile plastic container. The level of residual anticoagulants was not measured. The total IgG concentration of the serum pool was

16

determined by radial immunodiffusion and nephelometry, with the U.S. National Reference Preparation for Specific Human Serum Proteins (CDC) as a standard ([5](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380.htm#1#1)). Anti-PA specific IgG mass value assignment to the standard serum was done by differential adsorption, homologous enzyme-linked immunoassay (EIA), and heterologous ELISA (Semenova VA, et al., manuscript in preparation), with U.S. Food and Drug Administration (FDA) 1983 *Haemophilus influenzae* type b (Hib) reference serum ([6](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380.htm#1#1)).

#### ELISA Procedure

Polyoxyethylene sorbitol monolaurate (Tween 20) was purchased from BioRad Laboratories (Hercules, CA). Skim milk powder was obtained from Difco/Becton Dickinson (Atlanta, GA). Horseradish peroxidase (HRPO)–conjugated mouse anti-human IgG (affinity purified, -chain specific monoclonal clone HP6043) was obtained from Hybridoma Reagent Laboratories (Baldwin, MD). Peroxidase substrate 2,2´-azino-di(3-ethyl-benzthiazoline-6-sulfonate) (ABTS), hydrogen peroxide (H2O2), and peroxidase stop solution were obtained from Kirkegaard & Perry Laboratories (KPL, Gaithersburg, MD). All other laboratory reagents were obtained from Sigma Chemical Co. (St. Louis, MO) unless otherwise specified. Sterile, Type I endotoxin-free water was used for all ELISA procedures.

Immulon II-HB flat-bottom 96-well microtiter plates (Thermo Labsystems, Franklin, MA), were coated for 16 hrs at +4°C with 100 µL/well of rPA at a concentration of 2.0 µg/mL in 0.01 M phosphate-buffered saline (PBS), pH 7.4  (Life Technologies, Gaithersburg, MD). Plates were stored at +4°C without blocking and used within 7 days of preparation. Antigen-coated plates were then washed three times (ELX405 microplate washer, BioTek Instruments Inc., Winooski, VT) with PBS containing 0.1% Tween 20 and blotted dry by inversion on clean paper towels. Control and serum antibodies were tested without a separate blocking step. Serum standards and sera for testing were prepared at the appropriate dilutions in PBS containing 5% skim milk and 0.5% Tween 20, pH 7.4. The human standard reference serum and test sera were serially diluted twofold in the plate in the same buffer solution. The minimum dilution of test serum was 1/50. Three positive control sera from three separate donors and one negative control serum were each used at single dilution factors selected to give a range of optical density (OD) values across the standard reference curve. The final volume in all wells was 100 µL.

Test and standard sera were incubated in a humidified chamber (covered tray) for 60 min at 37°C, and the plates were then washed three times with PBS containing 0.1% Tween 20. Bound anti-PA IgG was then detected by using HRPO-conjugated mouse anti-human IgG Fc PAN monoclonal HP6043 diluted in PBS containing 5% skim milk and 0.5% Tween 20 (100 µL/well), and plates were incubated in a humidified chamber (covered tray) for 60 min at 37°C. Plates were again washed three times with PBS containing 0.1% Tween 20, and bound conjugate was detected colorimetrically by using ABTS/H2O2 substrate (100 µL/well). Color development was over 30 min (±5 min) and was stopped by addition of 100 µL of Peroxidase Stop Solution (KPL) to all wells of the test plates. OD values were read within 30 min of addition of the stop solution with a MRX Revelation microtiter plate reader (Thermo Labsystems, Franklin, MA) at a wavelength of 410 nm with a 610-nm reference filter. Data were analyzed by using a four-parameter (4-PL) logistic-log curve fitting model with ELISA for Windows software ([7](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380.htm#1#1)). A calibration factor for the standard reference serum was used to determine the concentration of anti-PA IgG in micrograms per milliliter of serum (µg/mL).

17

#### Competitive Inhibition ELISA

To enhance specificity, a supplementary rPA competitive inhibition ELISA (CI-ELISA) was developed based on the qualified anti-PA IgG ELISA. The CI-ELISA was a direct extension of the standard ELISA procedure with the following modifications. The anti-PA antibody concentrations of the test sera were first determined by using the standard ELISA. Only sera with a minimum reactivity level of 10 µg/mL anti-PA antibody were suitable for evaluation in the CI-ELISA. The 10-µg/mL threshold was determined empirically as the minimum level for which a reduction in ELISA reactivity could be assigned with statistical significance. A concentration of 50 µg rPA/500 µL diluted sample was chosen as the absorbing concentration after a preliminary study with ranges between 0 and 200 µg/mL ([8](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380.htm#1#1)). Test sera were then diluted to a concentration calculated to provide an OD value of approximately 1.0, based on their reactivity in the standard anti-PA ELISA. A 1-mL volume of each diluted serum was prepared and divided into two aliquots of equal volume. To one of these aliquots, rPA was added to a final concentration of 100 µg/mL. Both tubes were capped tightly and mixed by inversion for 16–18 hrs at +4°C. After this incubation, the tubes were centrifuged at 4°C for 10 min at 8,000 x *g* to remove precipitated materials. Test sera were incubated in the presence and absence of an excess of rPA in solution before analysis in the standard ELISA.

The supernatants were used without further dilution in the standard ELISA described above. Based on defined sera from anthrax vaccine recipients and confirmed clinical cases, a >85% suppression of reactivity in the competitive ELISA was identified as the threshold to discriminate between true positives and false positives.

#### Accuracy, Precision, Limits of Quantification, and Goodness of Fit

Accuracy describes the exactness of the assay to measure a known, true value of anti-PA IgG and to measure it repeatedly. In this study, accuracy was determined by repeated analysis of a positive control human anti-AVA antiserum for which differential absorption and heterologous ELISA had determined the anti-PA IgG concentration. Accuracy is expressed as the percent error between the assay-determined value and the assigned value for that serum. A percent error of <20% is an acceptable level of accuracy for an enzyme immunoassay ([9](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380.htm#1#1)). Precision, a measure of the degree of repeatability of an assay under normal operating conditions, is expressed as the coefficient of variation of the concentrations calculated for the standard reference curve dilutions within a single assay plate (intraassay precision) and between different assay plates (interassay precision) determined over time and controlling for different operators. Acceptable levels of intraassay and interassay precision are 10% and 20%, respectively ([9](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380.htm#1#1)), and these can be used to define the range of the assay and the upper and lower limits of quantification. The range of the assay is the interval between the upper and lower levels of antibody (inclusive) that have been demonstrated to be determined with these levels of precision and accuracy.

The “goodness of fit” of the assay is, for comparative purposes, an indication of how closely the data points of the reference serum standard curve fit the 4-PL model. Goodness of fit is expressed as the regression coefficient (R2) of the standard curve. An R2 value that approaches unity is indicative of a good fit for the data to the curve ([9](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380.htm#1#1)).

18

#### Limits of Detection of the Anti-PA IgG ELISA

|  |  |  |
| --- | --- | --- |
|  | **Figure**  |  |
|  | 02-0380t |  |
|  | [Click to view enlarged image](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380-G1.htm)**Figure.** Graphic representation of minimum detectable concentration (MDC), reliable detection limit (RDL), and reactivity threshold....  |  |

The 4-PL function was used to model the characteristic curve for the standards data. These data exhibit a sigmoidal shape when plotted on an OD-log10 dilution scale. The 4-PL function fits these data with a high degree of accuracy and extends the range of the assay, thus providing a more precise measurement of antibody concentration for patient sera ([10](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380.htm#1#1)). The lowest concentration of analyte (anti-PA IgG) that can be detected with a specific degree of probability in a diluted serum sample is defined as the minimum detectable concentration (MDC). The lowest concentration of analyte that has a high probability of producing a response significantly greater than the response at zero concentration of analyte is defined as the reliable detection limit (RDL). The MDC and RDL of the anti-PA IgG ELISA were derived from a 4-PL fit applied to the AVR414 standard reference serum ([9](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380.htm#1#1)). The MDC is the concentration of anti-PA antibody corresponding to the interpolated intersection of the lower asymptote of the upper 95% confidence interval (95% CI) with the 4-PL fit of the standards data. The RDL is the concentration of anti-PA antibody corresponding to the interpolated intersection of the upper 95% CI asymptote with the lower -95% CI of the standards data. The MDC and RDL are thus both derived from the 95% CIs of the standard curve. They are distinct and statistically robust measurements of the lower limits of detection of the assay; the RDL is the more conservative of the two. An illustration of the relationship of MDC and RDL to the standard curve is shown ([Figure](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380.htm#Figure#Figure)).

The reactivity threshold ([Figure](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380.htm#Figure#Figure)) is used to categorize a serum as reactive or nonreactive and to determine the diagnostic sensitivity (DSN) and diagnostic specificity (DSP) of the assay. The reactivity threshold of this assay was determined from the frequency distribution ([11](http://www.cdc.gov/ncidod/eid/vol8no10/02-0380.htm#11#11)) of log10-transformed OD values from a panel of sera from humans with non-anthrax-related clinical infections (554 observations) and a panel of control human sera (476 observations). The reactivity threshold was determined as the upper 95% CI of the frequency distribution from log10-transformed OD values of control human sera tested at 1/50 dilution. This OD value was converted to an anti-PA IgG concentration by using the standard curve calibration factor. Where this calculated value is below the MDC of the assay, the MDC becomes the default reactivity threshold. Ideally, the MDC, RDL, and reactivity threshold will all fall within the limits of quantification as defined above.

#### ELISA Diagnostic Sensitivity and Specificity

The DSP and DSN of the anti-PA IgG ELISA were determined. The quantitative test results were categorized into reactive or nonreactive by application of the reactivity threshold. The DSP of the assay was calculated as [TN/(TN+FP)], where TN = true negatives and FP = false positives. The DSN of the assay was calculated as [TP/(TP+FN)], where TP = true positives and FN = false negatives. Initially, serum specimens from clinical anthrax cases were insufficient to be useful in determining the DSN of the anti-PA IgG ELISA. Thus, the DSN was calculated by using sera from a cohort of anthrax vaccine recipients who had received a minimum of four subcutaneous injections of AVA.

19

**Appendix B:** Sample Questionnaire

The questionnaire below can be utilized in any setting, but is particularly effective in dealing with university students and administrators.

1. I understand something better after I
  **(a)** try it out.
  **(b)** think it through.
2. I would rather be considered
  **(a)** realistic.
  **(b)** innovative.
3. When I think about what I did yesterday, I am most likely to get
  **(a)** a picture.
  **(b)** words.
4. I tend to
  **(a)** understand details of a subject but may be fuzzy about its overall structure.
  **(b)** understand the overall structure but may be fuzzy about details.
5. When I am learning something new, it helps me to
  **(a)** talk about it.
  **(b)** think about it.
6. If I were a teacher, I would rather teach a course
  **(a)** that deals with facts and real life situations.
  **(b)** that deals with ideas and theories.
7. I prefer to get new information in
  **(a)** pictures, diagrams, graphs, or maps.
  **(b)** written directions or verbal information.
8. Once I understand
  **(a)** all the parts, I understand the whole thing.
  **(b)** the whole thing, I see how the parts fit.

20

1. In a study group working on difficult material, I am more likely to
  **(a)** jump in and contribute ideas.
  **(b)** sit back and listen.
2. I find it easier
  **(a)** to learn facts.
  **(b)** to learn concepts.
3. In a book with lots of pictures and charts, I am likely to
  **(a)** look over the pictures and charts carefully.
  **(b)** focus on the written text.
4. When I solve math problems
  **(a)** I usually work my way to the solutions one step at a time.
  **(b)** I often just see the solutions but then have to struggle to figure out the steps to get to them.
5. In classes I have taken
  **(a)** I have usually gotten to know many of the students.
  **(b)** I have rarely gotten to know many of the students.
6. In reading nonfiction, I prefer
  **(a)** something that teaches me new facts or tells me how to do something.
  **(b)** something that gives me new ideas to think about.
7. I like teachers
  **(a)** who put a lot of diagrams on the board.
  **(b)** who spend a lot of time explaining.
8. When I'm analyzing a story or a novel
  **(a)** I think of the incidents and try to put them together to figure out the themes.
  **(b)** I just know what the themes are when I finish reading and then I have to go back and find the incidents that demonstrate them.
9. When I start a homework problem, I am more likely to
  **(a)** start working on the solution immediately.
  **(b)** try to fully understand the problem first.

21

1. I prefer the idea of
  **(a)** certainty.
  **(b)** theory.
2. I remember best
  **(a)** what I see.
  **(b)** what I hear.
3. It is more important to me that an instructor
  **(a)** lay out the material in clear sequential steps.
  **(b)** give me an overall picture and relate the material to other subjects.
4. I prefer to study
  **(a)** in a study group.
  **(b)** alone.
5. I am more likely to be considered
  **(a)** careful about the details of my work.
  **(b)** creative about how to do my work.
6. When I get directions to a new place, I prefer
  **(a)** a map.
  **(b)** written instructions.
7. I learn
  **(a)** at a fairly regular pace. If I study hard, I'll "get it."
  **(b)** in fits and starts. I'll be totally confused and then suddenly it all "clicks."
8. I would rather first
  **(a)** try things out.
  **(b)** think about how I'm going to do it.
9. When I am reading for enjoyment, I like writers to
  **(a)** clearly say what they mean.
  **(b)** say things in creative, interesting ways.

22

1. When I see a diagram or sketch in class, I am most likely to remember
  **(a)** the picture.
  **(b)** what the instructor said about it.
2. When considering a body of information, I am more likely to
  **(a)** focus on details and miss the big picture.
  **(b)** try to understand the big picture before getting into the details.
3. I more easily remember
  **(a)** something I have done.
  **(b)** something I have thought a lot about.
4. When I have to perform a task, I prefer to
  **(a)** master one way of doing it.
  **(b)** come up with new ways of doing it.
5. When someone is showing me data, I prefer
  **(a)** charts or graphs.
  **(b)** text summarizing the results.
6. When writing a paper, I am more likely to
  **(a)** work on (think about or write) the beginning of the paper and progress forward.
  **(b)** work on (think about or write) different parts of the paper and then order them.
7. When I have to work on a group project, I first want to
  **(a)** have "group brainstorming" where everyone contributes ideas.
  **(b)** brainstorm individually and then come together as a group to compare ideas.
8. I consider it higher praise to call someone
  **(a)** sensible.
  **(b)** imaginative.
9. When I meet people at a party, I am more likely to remember
  **(a)** what they looked like.
  **(b)** what they said about themselves.

23

1. When I am learning a new subject, I prefer to
  **(a)** stay focused on that subject, learning as much about it as I can.
  **(b)** try to make connections between that subject and related subjects.
2. I am more likely to be considered
  **(a)** outgoing.
  **(b)** reserved.
3. I prefer courses that emphasize
  **(a)** concrete material (facts, data).
  **(b)** abstract material (concepts, theories).
4. For entertainment, I would rather
  **(a)** watch television.
  **(b)** read a book.
5. Some teachers start their lectures with an outline of what they will cover. Such outlines are
  **(a)** somewhat helpful to me.
  **(b)** very helpful to me.
6. The idea of doing homework in groups, with one grade for the entire group,
  **(a)** appeals to me.
  **(b)** does not appeal to me.
7. When I am doing long calculations,
  **(a)** I tend to repeat all my steps and check my work carefully.
  **(b)** I find checking my work tiresome and have to force myself to do it.
8. I tend to picture places I have been
  **(a)** easily and fairly accurately.
  **(b)** with difficulty and without much detail.

24

**Appendix C:** Internet Sources

 Again, these sources are coded and require proper authorization to decode.

## World Wide Web

Limb, Peter. "Alliance Strengthened or Diminished?: Relationships between Labour & African Nationalist/Liberation Movements in Southern Africa." <http://neal.ctstateu.edu/history/world\_history/archives/limb-l.html>. May 1992.

## FTP Site

Heinrich, Gregor <100303.100@compuserve.com>. "Where There Is Beauty, There is Hope: Sau Tome e Principe." <ftp.cs.ubc.ca> [path: pub/local/FAQ/african/gen/saoep.txt]. July 1994.

## Gopher Site

"Democratic Party Platform, 1860." <wiretap.spies.com> [Path: Wiretap Online Library/Civic & Historical/Political Platforms of the U.S.]. 18 June 1860.

Graeber, David <gr2a@midway.uchicago.edu>. "Epilogue to \*The Disastrous Ordeal of 1987\*". <gopher://h-net.msu.edu:70/00/lists/H-AFRICA/doc/graeber>. No date.

## Usenet Group Messages

Dell, Thomas <dell@wiretap.spies.com>. "[EDTECH] EMG: Sacred Texts (Networked Electronic Versions)." In <alt.etext>. 4 February 1993.

Legg, Sonya <legg@harquebus.cgd.ucar.edu>. "African history book list." In <soc.culture.african>. 5 September 1994. Archived at: <http://www.lib.ox.ac.uk/internet/news/faq/archive/african-faq.">http://www.lib.ox.ac.uk/internet/news/faq/archive/african-faq.general.html>.

## E-mail Messages

Page, Mel <pagem@etsuarts.east-tenn-st.edu>."African dance...and Malawi." Private e-mail message to Masankho Banda. 28 November 1994.

25

**Appendix D:** Comparative Statistics

|  |  |  |
| --- | --- | --- |
|  | **Rock Bottom** | **ChairIsMatic** |
| PERFORMANCE |  |  |
| Capacity | 498 cc | 399 cc |
| Valves | 4 per cylinder | 4 per cylinder |
| Adjustment | Screw and locknut | Screw and locknut |
| FRAME |  |  |
| Seat height | 780 mm | 780 mm |
| Dry weight | 157 Kg | 2.4 Kg |
| Castor | 29.5 degrees | 29.5 degrees |
| Trail | 115 mm | 115 mm |
| Rungs | 5 | 5 |
| Price | $525  | $530  |

26